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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/543,050	12/12/2005	Kenichi Ishibashi	S1459.70081US00	2592

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EXAMINER	
NOVACEK, CHRISTY L	

ART UNIT	PAPER NUMBER
2822	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/543,050	ISHIBASHI ET AL.	
	Examiner	Art Unit	
	CHRISTY L. NOVACEK	2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 May 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *10* is/are allowed.

6)☒ Claim(s) *1-9,11-16,18 and 19* is/are rejected.

7)☒ Claim(s) *17* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *07/08/2009*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

This office action is in response to the amendment filed May 27, 2009.

Response to Amendment

The limitations added to claims 1, 10, 13 are sufficient to overcome the rejections of claims 1-5, 10 and 13 as being unpatentable over Nakamura (US 20020015881) and Yoshikawa (US 6,586,670). Therefore, these rejections have been withdrawn.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 3, 4 and 13 are rejected under 35 U.S.C. 102(a) as being anticipated by Azuma et al. (JP 2002-289269, cited in IDS).

Regarding claims 1 and 13, Azuma discloses coating a transparent conductive substrate with a paste including a semiconductor fine grain and a binder made of a polymer (cellulose-type) compound (¶ 0056), sintering the paste at a temperature of 450°C to form a semiconductor

layer made of a semiconductor fine grain (¶ 0056), and irradiating the semiconductor layer with ultraviolet (180-400 nm wavelength) rays to remove an organic substance in the semiconductor layer using a photocatalyst effect of the semiconductor fine grain (¶ 0046, 0047, 0056).

Regarding claim 3, Azuma discloses that the semiconductor fine grain can be made of titanium oxide, zinc oxide or strontium titanate (¶ 0027).

Regarding claim 4, Azuma discloses that the polymer binder can have a viscosity improving effect (¶ 0040).

Claims 6 and 14 are rejected under 35 U.S.C. 102(e) as being anticipated by Nakamura et al. (US 20020015881, cited in IDS).

Regarding claims 6 and 14, Nakamura discloses a semiconductor layer made of semiconductor fine grain, with the semiconductor fine grain is fused by sintering (¶ 0048) and can be made of a plurality of types of semiconductor fine grain which exhibit photocatalyst behavior (¶ 0036).

Claims 7-9, 11, 12, 15 and 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Nishimoto (US 6,100,466).

Regarding claims 7-9, 11 and 12, Nishimoto discloses an electronic apparatus having a substrate and semiconductor layer made of semiconductor fine grain having a carbon (organic) content of 0.1 atomic ppm (parts per million) to 0.1 atomic % on the substrate (col. 5, ln. 54 – col. 6, ln. 10).

Regarding claim 15, Nishimoto discloses that the electronic apparatus is a photoelectric conversion device (Abstract).

Regarding claim 19, Nishimoto discloses that the semiconductor fine grain can be made of a plurality of kinds of semiconductor fine grain that inherently exhibit photocatalyst behavior (col. 5, ln. 54 – col. 6, ln. 67).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 2, 5 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Azuma et al. (JP 2002-289269, cited in IDS) in view of Yoshikawa (US 6,586,670, cited in IDS).

Regarding claim 2, Azuma discloses that various photocatalytic materials can be used to make the semiconductor fine grain, but Azuma does not specifically disclose forming the semiconductor fine grain of a plurality of kinds of semiconductor fine grain (¶ 0027). Like Azuma, Yoshikawa discloses making a photoelectric conversion device having a layer of semiconductor fine grain (Abstract). Yoshikawa teaches that the semiconductor fine grain can be made of a plurality of kinds of semiconductor fine grain (col. 18, ln. 32-42). Specifically Yoshikawa teaches that a combination of titanium oxide, zinc oxide, niobium oxide and strontium titanate is particularly preferred (col. 18, ln. 38-40). At the time of the invention, it would have been obvious to one of ordinary skill in the art to form the semiconductor fine grain

of Azuma of a plurality of kinds of semiconductor fine grain because Azuma discloses that the fine grain can be made of titanium oxide, zinc oxide, niobium oxide or strontium titanate materials and Yoshikawa teaches that a combination of titanium oxide, zinc oxide, niobium oxide and strontium titanate is particularly preferred.

Regarding claim 5, Azuma discloses that a cellulose-type polymer can be used to adjust the viscosity of the semiconductor fine grain dispersion, but does not disclose using polyethylene glycol as the polymer that adjusts the viscosity (¶ 0040, 0056). Yoshikawa discloses adding a viscosity modifier to the dispersion and teaches that it is preferable to add polyethylene glycol to the dispersion because the viscosity of the dispersion and the porosity of the semiconductor fine grain can be controlled by changing the molecular weight of the polyethylene glycol and the semiconductor fine grain film formed on the substrate using the polyethylene glycol is hardly peeled off (col. 19, ln. 28-40). At the time of the invention, it would have been obvious to one of ordinary skill in the art to use a polyethylene glycol viscosity modifying agent in the dispersion of Azuma because Azuma discloses using a viscosity modifier in the dispersion and Yoshikawa teaches that it is preferable to a viscosity modifier of polyethylene glycol.

Regarding claim 18, Azuma discloses sintering the semiconductor fine grain at a temperature of 450°C, but does not disclose the time period for which it is heated (¶ 0056). Yoshikawa discloses that the process of sintering the semiconductor fine grain can be conducted at 40-700°C for a time period of 10 minutes to 10 hours (col. 20, ln. 12-18). At the time of the invention, it would have been obvious to one of ordinary skill in the art to heat the semiconductor fine grain of Azuma for a time period of 10 minutes to 10 hours because Azuma

does not disclose the time period for the sintering and Yoshikawa discloses that the sintering can be successfully carried out by heating for 10 minutes to 10 hours.

Claim 16 is rejected under U.S.C. 103(a) as being unpatentable over Azuma (JP 2002-289269).

Regarding claim 16, Azuma discloses irradiating the semiconductor fine grain with ultraviolet rays (¶ 0034). Azuma does not disclose the period of time for which the ultraviolet rays are irradiated. At the time of the invention, it would have been obvious to one of ordinary skill in the art to use routine experimentation to determine an appropriate period of time for which to irradiate the semiconductor fine grain of Azuma such that the fine grain has the desired electrical characteristics because Azuma discloses carrying out irradiation but does not disclose a time period for the irradiation and because such variables of art recognized importance are subject to routine experimentation and discovery of an optimum value for such variables is obvious. See *In re Aller*, 105 USPQ 233 (CCPA 1955). The Examiner considers the claim limitation, "for up to approximately 70 hours" to mean that the rays are irradiated for anywhere from 0 to 70 hours.

Allowable Subject Matter

Claim 10 is allowed.

Claim 17 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is an examiner's statement of reasons for allowance:

The primary reasons for the allowance of claim 10 and the indication of allowable subject matter in claim 17 is the inclusion therein, in combination as currently claimed, of the limitations of irradiating the semiconductor fine grain using ultraviolet rays such that the irradiation is carried out for 70 hours. These limitations were found in claims 10 and 17 and are neither disclosed nor taught by the prior art of record, alone or in combination.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Response to Arguments

Applicant's arguments with respect to claims 1-5, 7-9, 11-13 and 15 have been considered but are moot in view of the new ground(s) of rejection.

Applicant's arguments filed regarding the rejections of claims 6 and 14 have been fully considered but they are not persuasive. Nakamura discloses various semiconductor materials that can be used to comprise the semiconductor fine particle layer. These materials are inherently photocatalytic. Nakamura states, "These semiconductors can be used either individually or in the form of a composite thereof, such as a mixture, a mixed crystal or a solid solution." (¶ 0036). Therefore, Nakamura meets all the limitations of claims 6 and 14.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christy L. Novacek whose telephone number is (571) 272-1839. The examiner can normally be reached on Monday-Friday 12:00pm - 6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra Smith can be reached on (571) 272-2429. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

CLN
August 16, 2009
/Zandra V. Smith/
Supervisory Patent Examiner, Art Unit 2822